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(56) Documents Cited
GB 2038105 A GB 2018038 A EP 0585786 A2
US 5060128 A

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INT CL^6 H01F 27/40 38/42

(54) Flyback transformer and a method of manufacture thereof

(57) A flyback transformer comprises a low-voltage coil bobbin 4 wound with a primary coil, a high-voltage coil bobbin 8 wound with a secondary coil, high-voltage diodes 17 and a ringing damping circuit 6. The high-voltage coil bobbin has terminals 11, 12 and first additional terminals 13b, d, e are provided next to the terminals 11, and second additional terminals 13a, c are provided next to the terminals 12. The ringing damping circuit 6 is connected and fixed between the first additional terminals and the second additional terminals in parallel to the high-voltage diodes 17 which are connected and fixed between the terminals 11 and 12.

F I G. 1

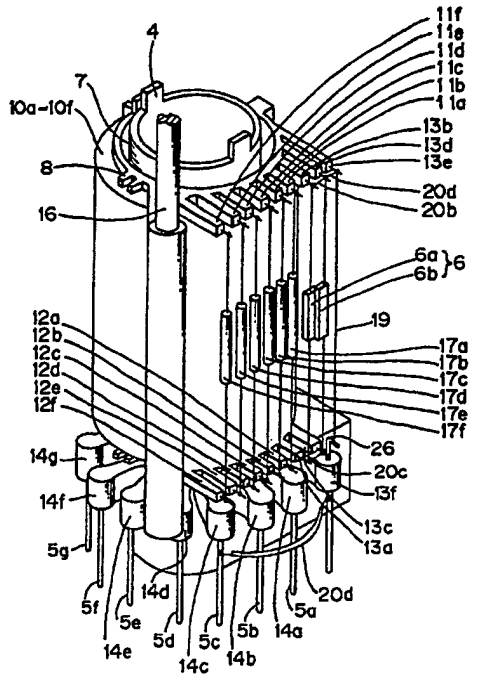

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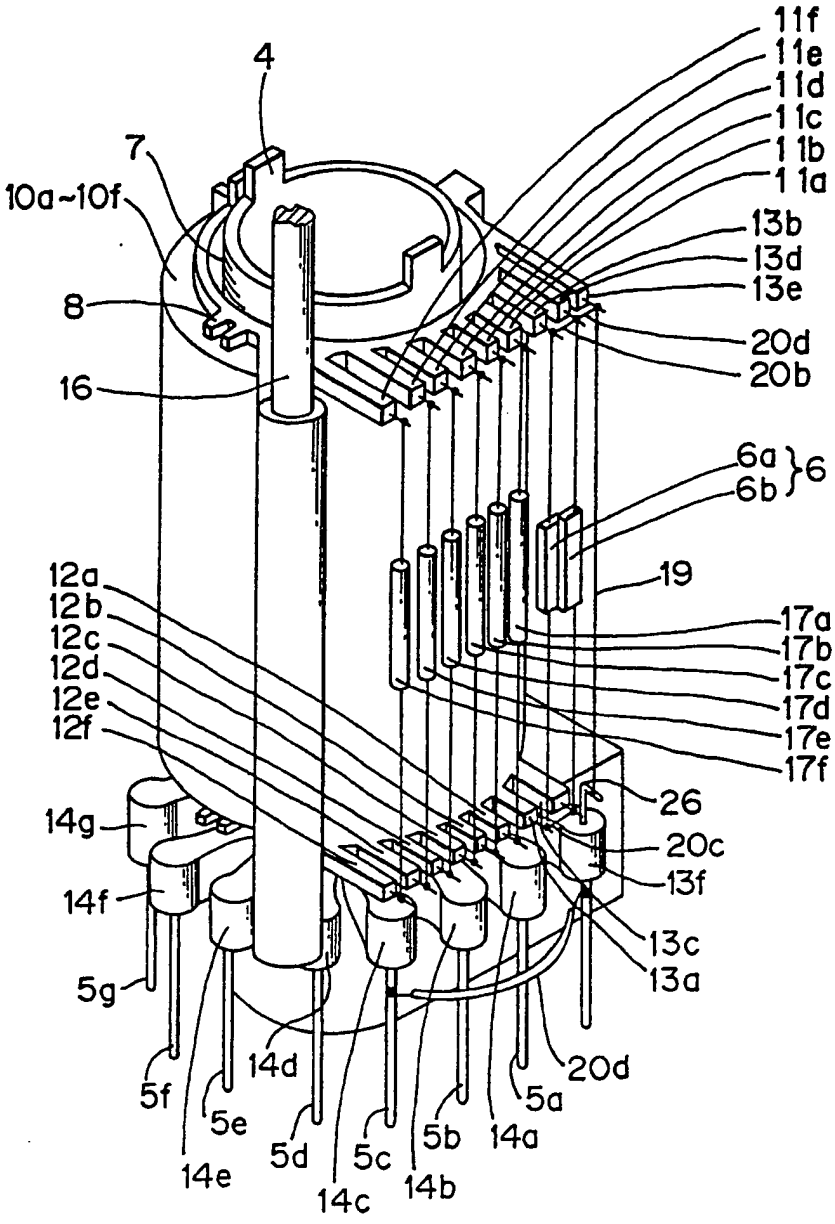
FIG. 1


11f
11e
11d
11c
11b
11a
4
7
10a~10f
13b
13d
13e
8
20d
20b
16
6a
6b
6
19
12a
12b
12c
12d
12e
12f
17a
17b
17c
17d
17e
17f
26
14g
20c
14f
13f
13c
13a
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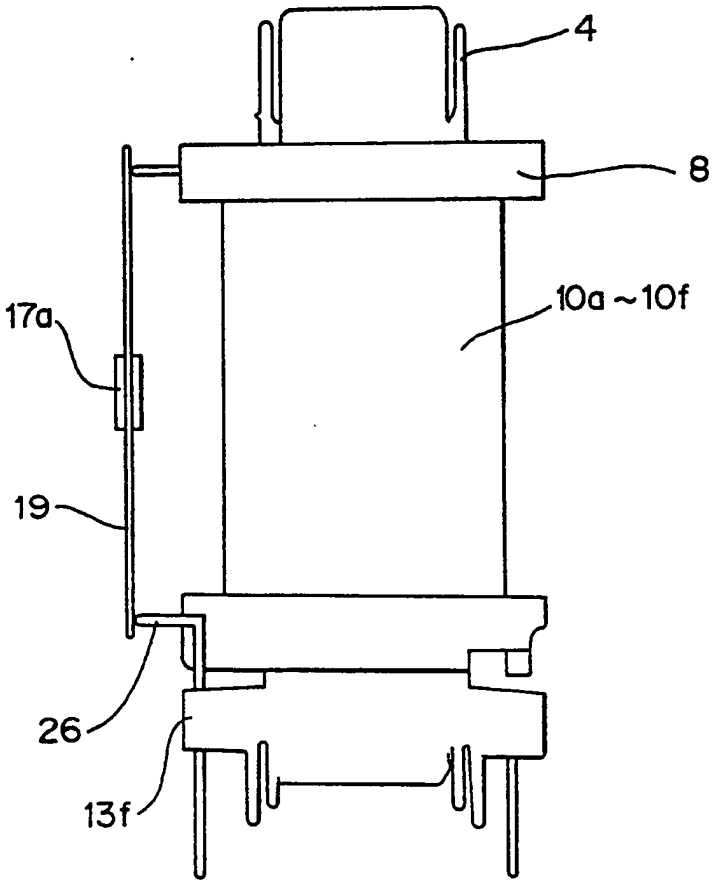
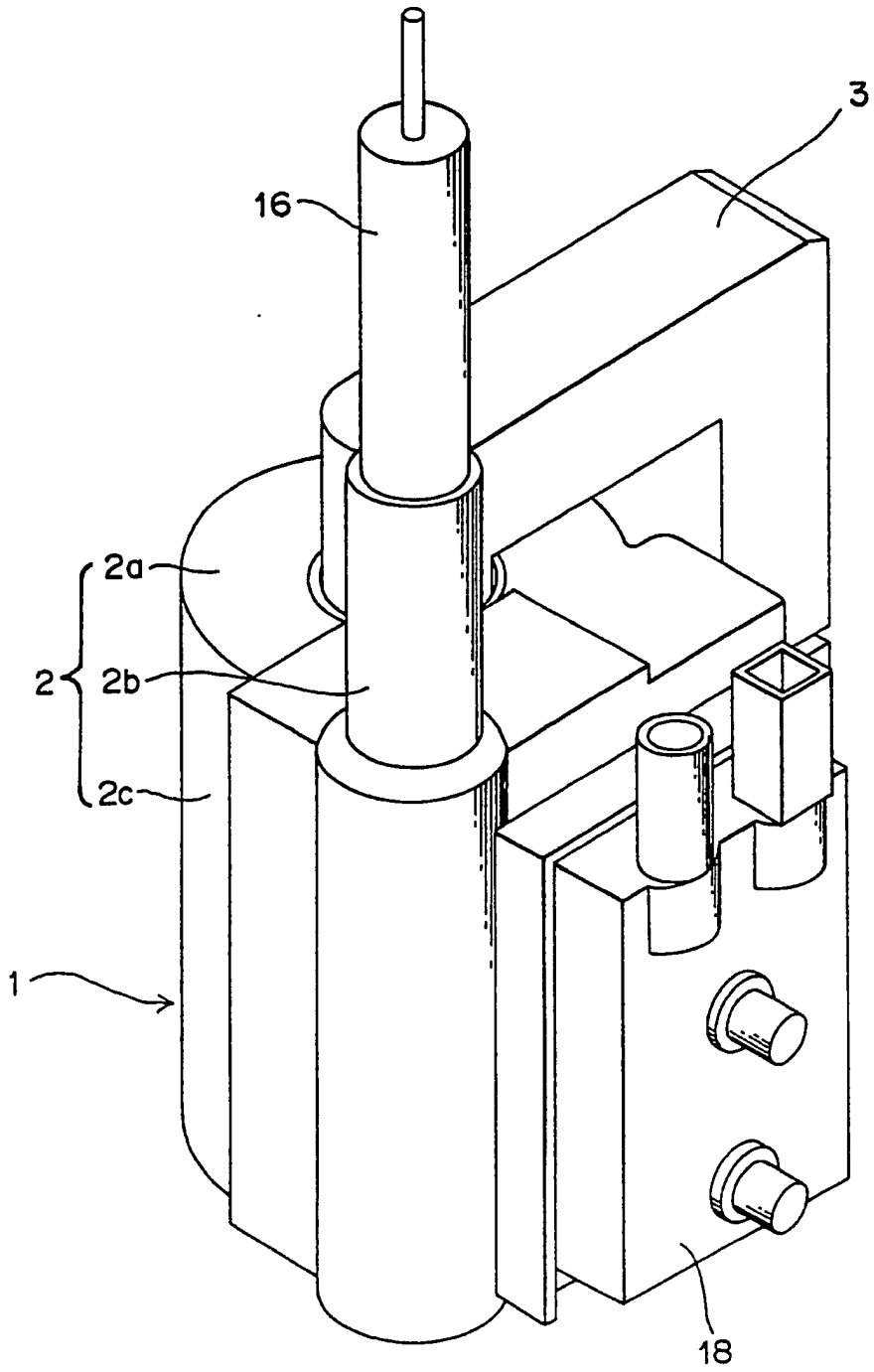
14c
14b

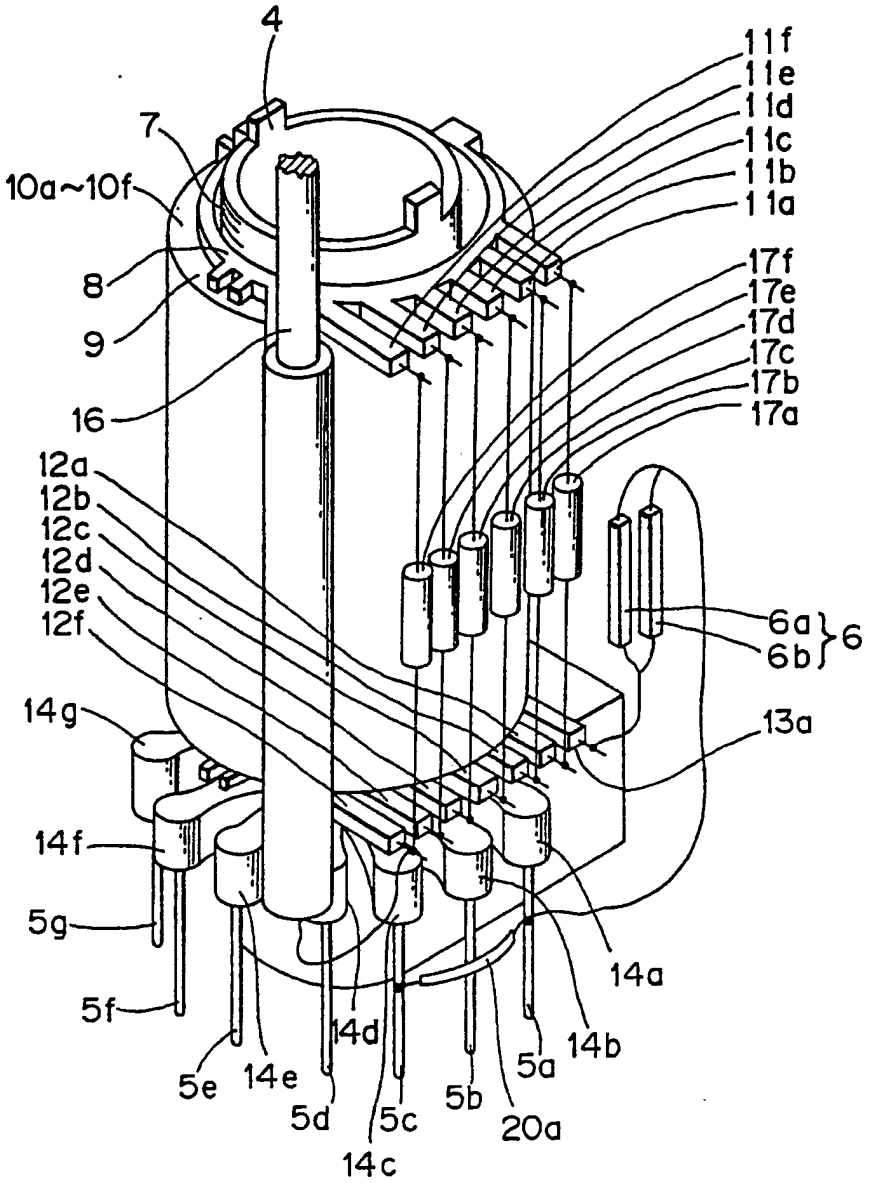
FIG. 2



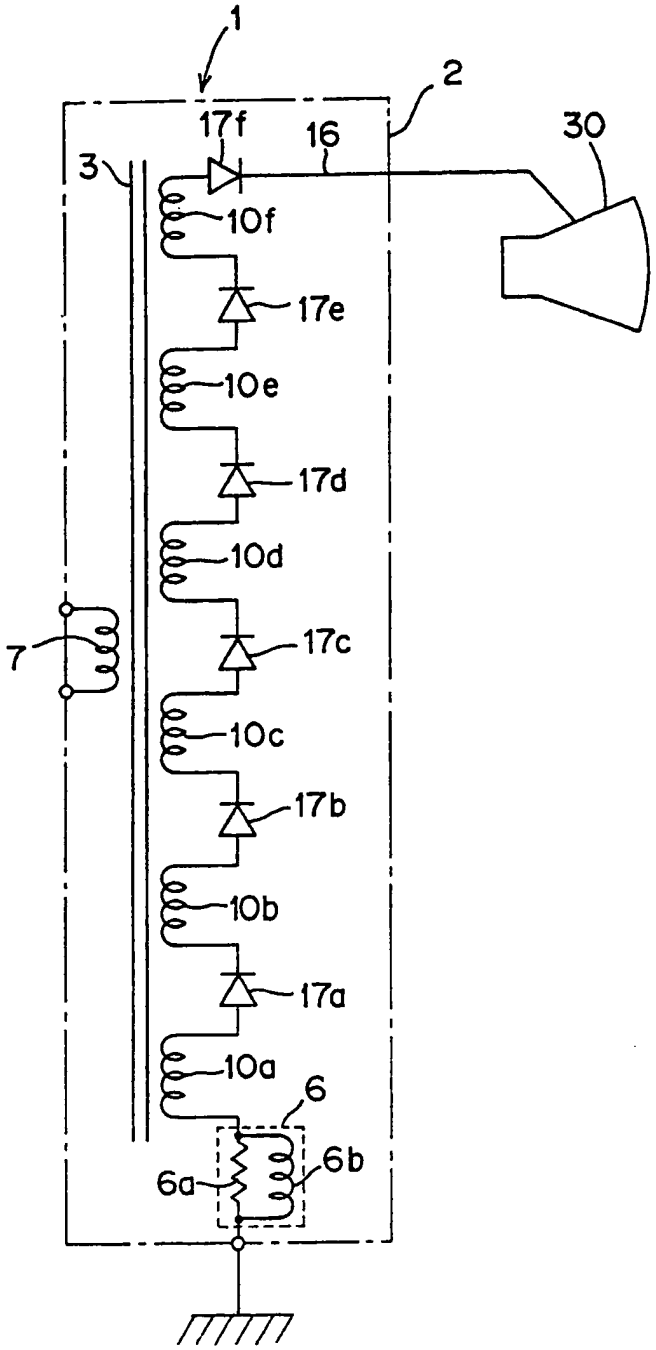
F I G. 3 PRIOR ART



F I G. 4 PRIOR ART



F I G. 5 PRIOR ART



FLYBACK TRANSFORMER AND A METHOD OF MANUFACTURE THEREOF

The present invention relates to a flyback transformer and a method of production.

The present invention seeks to provide a flyback transformer which prevents a short-circuit of a ringing damping circuit and facilitates a process of connecting the ringing damping circuit, and a method of producing the flyback transformer.

In order to attain the object, a flyback transformer according to the present invention comprises:

a low-voltage coil bobbin which is wound with a primary coil and has a plurality of terminals at a lower end, each of the terminals having a terminal pin;

a high-voltage coil bobbin which is wound with a secondary coil divided by high-voltage diodes and has AC terminals and DC terminals at an upper end and a lower end respectively, each of the AC and DC terminals having a terminal pin, the high-voltage diodes being connected and fixed between the AC terminals and the DC terminals, the high-voltage coil bobbin engaging with the low-voltage coil bobbin;

a ringing damping circuit which comprises a resistor and an inductor which are connected in parallel, one end of the ringing damping circuit being connected to a lowest-

voltage portion of the secondary coil wound around the high-voltage coil bobbin, the other end of the ringing damping circuit being connected to the terminals of the low-voltage coil bobbin; and

first additional terminals provided next to the AC terminals of the high-voltage coil bobbin and second additional terminals provided next to the DC terminals of the high-voltage coil bobbin, each of the first and second additional terminals having a pin, the ringing damping circuit being connected and fixed between the first additional terminals and the second additional terminals.

In a producing method of the flyback transformer according to the present invention, the connection of the high-voltage diodes between the AC terminals and the DC terminals and the connection of the ringing damping circuit between the first additional terminals and the second additional terminals are carried out in the same step.

In the flyback transformer according to the present invention, the ringing damping circuit is connected between the first additional terminals next to the AC terminals and the second additional terminals next to the DC terminals, and thereby, the ringing damping circuit is fixed.

Also, as far as a producing method of the flyback transformer, since the first and second additional terminals are provided next to the DC terminals and the AC terminals beforehand, the high-voltage diodes and the ringing damping

circuit can be connected and fixed in the same step. Thereby, the producing method can be simplified.

A preferred embodiment of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a fragmentary perspective view of a flyback transformer according to the present invention;

Fig. 2 is a fragmentary side view of the flyback transformer according to the present invention;

Fig. 3 is a perspective view of a conventional flyback transformer;

Fig. 4 is a fragmentary perspective view of the conventional flyback transformer; and

Fig. 5 is a circuit diagram of the conventional flyback transformer.

Referring first to the last three Figs, Figs. 3 to 5 show a flyback transformer of prior art. Figs. 3, 4 and 5 show respectively a perspective view, a fragmentary perspective view and a circuit diagram of the flyback transformer.

Numeral 1 denotes the flyback transformer, and numeral 2 denotes an insulating case which is made of an insulating resin. The insulating case 2 comprises a body 2a which is shaped as a cylinder with a bottom and covers the circumference of a divided type high-voltage coil 10a through 10f, an anode lead wire cover 2b which is cylindrical and disposed on an upper surface of the body 2a, and a focus potentiometer fitting portion 2c which is disposed on a side surface of the body 2a. An anode lead wire 16 which is connected to a division 10f of the high-voltage coil via a high-voltage diode 17f is inserted in the anode lead wire cover 2b. A focus potentiometer 18 for generating and regulating a focus voltage is fitted to the focus potentiometer fitting portion 2c.

Numeral 3 denotes a ferrite core formed by U-shaped cores abutted on each other. The ferrite core 3 is fitted to a low-voltage coil bobbin 4 and the insulating case 2.

The low-voltage coil bobbin 4 is cylindrical, and a leg of the ferrite core 3 pierces into the low-voltage coil bobbin 4. A coil 7 is wound around the bobbin 4, and terminals 14a through 14g which have terminal pins 5a through 5g respectively are disposed at a lower end opening of the bobbin 4.

Numeral 8 denotes a high-voltage coil bobbin which engages with the low-voltage coil bobbin 4 to be fitted around the low-voltage coil 7. A coil is wound around the high-voltage coil bobbin 8 to form six layers 10a through 10f with six intermediate sheets thereamong, and the coil is divided by the high-voltage diodes 17a through 17f outside the bobbin 8. AC terminals 11a through 11f, each of which has a terminal pin, are disposed at an upper end of the high-voltage coil bobbin 8. The AC terminals 11a through 11f are connected to the high-voltage diodes 17a through 17f through the high-voltage coil divisions 10a through 10f respectively. DC terminals 12a through 12f, each of which has a terminal pin, are disposed at a lower end of the high-voltage coil bobbin 8 to be opposite the AC terminals 11a through 11f. The DC terminals 12a through 12f are connected to the high-voltage diodes 17a through 17f through the high-voltage coil divisions 10a through 10f respectively. Fur-

ther, an additional terminal with a pin 13a is provided next to the DC terminal 12a and is connected to a parallel circuit for damping ringing, which will be described in detail later.

The high-voltage diodes 17a through 17f are disposed between the AC terminals and the DC terminals, and extend parallel to one another along the axis of the high-voltage coil bobbin 8. The high-voltage diodes 17a through 17f and the high-voltage coil divisions 10a through 10f are connected in series alternately such that the outputs of the coil divisions 10a through 10f are summing-rectified. More specifically, a winding start portion of the coil division 10a is connected to the terminal 13a, and a winding end portion thereof is connected to the DC terminal 11a. A negative terminal of the high-voltage diode 17a is connected to the AC terminal 11a, and a positive terminal thereof is connected to the DC terminal 12a. A winding start portion of the coil division 10b is connected to the DC terminal 12a, and a winding end portion thereof is connected to the AC terminal 11b. A negative terminal of the high-voltage diode 17b is connected to the AC terminal 11b, and a positive terminal thereof is connected to the DC terminal 12b. In the same manner, the high-voltage coil divisions 10c through 10f and the high-voltage diodes 17c through 17f are connected in series alternately via the AC terminals 11c through 11f and the DC terminals 12c through 12f. A positive terminal of the high-voltage diode 17f, where the highest voltage is generat-

ed, is connected to the anode lead wire 16 via the DC terminal 12f and further to a cathode-ray tube 30.

Numeral 6 denotes the above-mentioned parallel circuit for damping ringing. The ringing damping circuit 6 is composed of a resistor 6a and a coil 6b which functions as an inductor, and the resistor 6a and the coil 6b are connected in parallel. One end of the ringing damping circuit 6 is connected to the terminal 13a, and the other end thereof is connected to the terminal 5a of the terminal 14a of the low-voltage bobbin 4. The terminal pin 5a is connected to the terminal pin 5c of the terminal 14c by a lead wire 20a, and the terminal pin 5c is connected to an automatic brightness limiter (ABL) circuit.

Fig. 5 is a circuit diagram of the flyback transformer 1. When a fundamental wave which resonates with a lateral deflection frequency enters the low-voltage coil 7, voltages which are of the same form as the fundamental wave and are higher than the fundamental wave occur on the high-voltage coil divisions 10a through 10f. These voltages are summing-rectified by the high-voltage diodes 17a through 17f, and the summing-rectified voltage is impressed on the cathode-ray tube 30 as an anode voltage via the anode lead wire 16.

Next, a method of producing the flyback transformer 1 is described.

First, the low-voltage coil bobbin 4 wound with the low-voltage coil 7 and the high-voltage coil bobbin 8 wound

with the divided type high-voltage coil 10a through 10f are engaged with each other. Thereafter, the high-voltage coil divisions 10a through 10f are connected to the AC terminals 11a through 11f and the DC terminals 12a through 12f.

Next, the positive terminals of the high-voltage diodes 17a through 17f are connected to the DC terminals 12a through 12f, and the negative terminals thereof are connected to the AC terminals 11a through 11f. These connections are made by welding.

Next, one end of the ringing damping circuit 6 is connected to the terminal 13a of the high-voltage coil bobbin 8, and the other end thereof is connected to the terminal pin 5a of the terminal 14a of the low-voltage coil bobbin 4.

The assembled body is put into the insulating case 2, and the anode lead wire 16, the focus potentiometer 18 and the ferrite core 3 are fitted to the insulating case 2. Further, an insulating resin is vacuum-casted and hardened, and thus, the flyback transformer 1 is finished.

In this flyback transformer 1, the ringing damping circuit 6 is not fixed, and there is a possibility that the ringing damping circuit 6 may come into contact with terminals of the high-voltage diodes, the DC terminals and/or the AC terminals of the high-voltage coil bobbin 8, thereby causing a short-circuit. The connections of the high-voltage diodes 17a through 17f between the AC terminals and the DC terminals and the connections of the ringing damping circuit

6 between the terminals 13a and 14a are carried out separately, which prevents improvement of productivity.

Referring now to Figs. 1 and 2, there is shown the structure of a flyback transformer according to the present invention. Fig. 1 is a fragmentary perspective view of the flyback transformer, and Fig. 2 is a fragmentary side view thereof. The same components as those of the above-described flyback transformer according to the prior art are referenced by the same symbols, and a detailed description of these components is omitted.

The flyback transformer according to the present invention is characterized in that a plurality of additional terminal pins are provided next to the DC terminals and the AC terminals of the high-voltage coil bobbin and in that the ringing damping circuit is connected and fixed between the additional terminals next to DC terminals and those next to the AC terminals. The following describes the structure.

The high-voltage coil bobbin 8 has additional terminals 13b, 13d and 13e next to the AC terminals 11a through 11f, and the additional terminals 13b, 13d and 13e extend parallel to the AC terminals 11a through 11f. Next to the DC terminals 12a through 12f, the terminal 13a and one more additional terminal 13c are provided so as to extend parallel to the DC terminals 12a through 12f. The low-voltage coil bobbin 4 has an additional terminal 13f with a terminal pin 26. The additional terminal 13f is opposite the additional terminal 13e, and the terminal pin 26 extends parallel to the

terminals 12a through 12f, 13a and 13c. As described, the ringing damping circuit 6 is composed of the resistor 6a and the inductor 6b. One end of the resistor 6a and one end of the inductor 6b are connected to the terminals 13b and 13d respectively, and the other end of the resistor 6a and the other end of the inductor 6b are connected to the terminals 13a and 13c. The terminals 13a and 13c are connected by a lead wire 20c, and the terminals 13b and 13d are connected by a lead wire 20b. Thus, the ringing damping circuit 6 is structured. It is possible to use coils instead of the lead wires 20b and 20c. Since the resistor 6a and the inductor 6b are connected in parallel, their positions can be exchanged with each other. The winding start portion of the high-voltage coil division 10a, which has the lowest voltage, is connected to the terminal 13a, which is connected to an end of the ringing damping circuit 6. The ringing damping circuit 6 is also connected to the terminal 13f by connecting the terminals 13d and 13e through a lead wire 20a and connecting the terminals 13e and 13f through a jumper lead wire 19. The additional terminal 13f is connected to the terminal pin 5c of the terminal 14c, which is connected to the automatic brightness limiter (ABL) circuit, by a lead wire 20d. It is possible to use a single lead wire for connections between the terminals 13b and 13d and between the terminals 13d and 13e. Also, instead of the lead wires 20a through 20d, coils used for the divided high-voltage coil can be used.

In the flyback transformer of this structure, the ringing damping circuit 6 is connected and fixed between the additional terminals 13b and 13d next to the AC terminals and the additional terminals 13a and 13c next to the DC terminals, and there is no fear that the ringing damping circuit 6 may come into contact with the terminals of the high-voltage diodes, the DC terminals and/or the AC terminals of the high-voltage coil bobbin, thereby causing a trouble.

In the structure, the AC terminals and the DC terminals of the high-voltage coil bobbin are opposite each other, and the ringing damping circuit is connected and fixed between the additional terminals next to the AC terminals and those next to the DC terminals. Since the AC terminals and the neighboring additional terminals, and the DC terminals and the neighboring additional terminals are disposed at regular intervals, the high-voltage diodes and the ringing damping circuit can be connected between the opposite terminals in the same step, which improves the productivity.

Although the present invention has been described in connection with the preferred embodiment, it is to be noted that various changes and modifications are possible to those who are skilled in the art. Such changes and modifications are to be understood as being within the scope of the present invention as specified in the claims.

CLAIMS

1. A flyback transformer comprising:

a low-voltage coil bobbin which is wound with a primary coil and has a plurality of terminals at one end, each of the terminals having a terminal pin; a high-voltage coil bobbin which is wound with a secondary coil divided by high-voltage diodes and has AC terminals and DC terminals at respective opposite ends, each of the AC and DC terminals having a terminal pin, the high-voltage diodes being connected and fixed between the AC terminals and the DC terminals, the high-voltage coil bobbin engaging with the low-voltage coil bobbin; and a ringing damping circuit which comprises a resistor and an inductor which are connected in parallel, one end of the ringing damping circuit being connected to a lowest-voltage portion of the secondary coil wound around the high-voltage coil bobbin, the other end of the ringing damping circuit being connected to the terminals of the low-voltage coil bobbin; wherein there are provided first additional terminals next to to the AC terminals of the high-voltage coil bobbin and second additional terminals provided next to the DC terminals of the high-voltage coil bobbin, each of the first and second additional terminals having a terminal pin, the ringing damping circuit being connected and fixed between the first additional terminals and the second additional terminals.

2. A flyback transformer substantially as herein described with reference to Figs 1 and 2 of the accompanying drawings.

3. A method of producing a flyback transformer as claimed in claim 1, wherein the connection of the high-voltage diodes between the AC terminals and the DC terminals and the connection of the ringing damping circuit between the first additional terminals and the second additional terminals are carried out in one step.

4. A method of producing a flyback transformer substantially as herein described with reference to Figs 1 and 2 of the accompanying drawings.

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Patents Act 1977
Examiner's report to the Comptroller under Section 17
(T' Search report)

Application number
GB 9504303.0

Relevant Technical Fields

(i) UK Cl (Ed.N) H1T

(ii) Int Cl (Ed.6) H01F (38/42, 27/40)

Search Examiner
J A WATT

Date of completion of Search
17 MAY 1995

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii)

Documents considered relevant following a search in respect of Claims :-
1-4

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
Y	GB 2038105 A	(RCA) Figures 1-5	1
Y	GB 2018038 A	(TOKYO) Figure 1, note capacitor 48	1
P,X	EP 0585786 A2	(SANYO) Figures 1-3c and 20-25, lines 14-45, column 1	1, 3
Y	US 5060128 A	(VICTOR) Figure 4 and lines 37-48, column 4	1

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).